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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/735,771

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Akihisa Hongo

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WENDEROTH, LIND & PONACK, L.L.P.

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EXAMINER

MACARTHUR, SYLVIA

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/735,771	<b>Applicant(s)</b> HONGO ET AL.	
	<b>Examiner</b> Sylvia R. MacArthur	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 August 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 34,38,40,41 and 54-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 34,38,40,41 and 54-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Arguments***

I. Applicant's arguments with respect to claims 34,38, 40, and 41 of 18/22/2008 and 4/30/2008 have been considered but are unpersuasive. Applicant argues on pages 4-7 that applicant fails to teach the amendments to the claims such as that the processing liquid supply section comprises supply ports and suction ports with each of the supply ports being in a corresponding one of the cathodes and with each of the suction ports being a corresponding one of said anodes, see Figures 20A, 22A, and 36A of Wang et al. Furthermore, applicant argues that the prior art fails to teach the collapse of bubbles so as not to produce bubbles. The specification of the present invention recites that an impulse from ultrasonic energy that would cause the production of bubbles is prevented so as not to cause damage to a device. Applicant further recites that the magnitude of the frequency is chosen to prevent such damage. Note that the magnitude of frequency is a process parameter that is controlled by the prior art resulting from the modification of Wang et al via Boyd et al.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 34, 38, 41, and 54-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (WO 00/03426) in view of Boyd et al (US 7,264,007).

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Wang teaches a method and apparatus for electropolishing metal interconnections of semiconductor devices.

Regarding claim 34: Wang et al teaches a substrate processing apparatus (electropolisher 50) comprising a substrate holder/chuck 29 (note the type of film on the substrate does not structurally limit the apparatus as the substrate 31 (wafer) worked upon is not part of the apparatus, see *In re Young*, 75 F. 2d 966, 25 USPQ 69 (CCPA 1935)), a processing head (polishing receptacle 100 with electrodes 1,2,3 which function as anodes and cathodes see page 14 of Wang et al), a processing liquid supply section (fluid inlet 5,7,9), and a power source 13, 12, and 11, see the abstract and Figs. 20A and 20B. The abstract further teaches that an electrolyte 34 is delivered through the fluid inlets. See the location of the cathodes and anodes relative the inlets and suction ports.

Wang et al fails to teach that ultrasonic transducer is on the processing head.

Boyd et al teaches a proximity (processing head) with inlet and suction ports see Figs. 6D and 9A similar to Wang et al. In col.8 lines 28-35, Boyd et al teaches that the transducer is located within the proximity/processing head 106a and/or 106b. Col. 15 lines 64-67 and claim 11 of Boyd et al teaches that the acoustic energy could also be ultrasonic energy. The motivation to provide an ultrasonic transducer is to enhance cleaning of the wafer by using the cavitations that is bubbles that are generated and collapsed, see also col. 16 lines 22-40. Further note that providing the transducer of Boyd et al in the processing head of Wang et al is would result in the transducer facing the substrate as the processing head faces the substrate see Fig. 20A,20B and the transducer would also be arranged next the anodes and cathodes as the inlet/outlet ports

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Thus it would have been obvious at the time of the claimed invention to use the teachings of Boyd et al in the processing head of Wang et al as it shows that it is advantageous to provide an ultrasonic transducer on the processing head as the acoustic energy from the transducers creates cavitations that enhance the cleaning of the wafer.

Pulse power supplies are discussed on page 16 lines 3-10 of Wang et al. See also col. 2 lines 39-46 wherein The RF supply of Boyd et al is controlled by an adjustable voltage controlled oscillator (which is an alternative to pulse voltage source) that essentially results in the pulse voltage.

Regarding claim 38 Note Figs. 9A, 10, and 11 is arranged symmetrically about a center of the head. Neither Wang et al not Boyd et al teaches a plurality of transducers or that the shape of the transducers is generally triangular. The use of a plurality of ultrasonic transducers is interpreted as a matter of the duplication of parts. In re Harza, 274 F. 2d 669, 124 USPQ 378 (CCPA 1960) supports the conclusion that the mere duplication of parts has not patentable significance unless a new and unexpected result is produced. The motivation to provide additional transducers is to create zones of acoustic energy along the radius of the wafer and further provide uniform and enhanced cleaning. Regarding the shape of the transducers, the examiner deems obvious the shape of the transducer and deems that the shape is well within the skill of one designing the transducer. Further note that it was held by Dailey, 357 F. 2d 669, 149 USPQ 47 (CCPA 1966) that the shape of the transducer is a matter of choice which a person of ordinary skill in the Art would have found obvious absent persuasive evidence that the particular shape was significant, see also MPEP 2144.04d).

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Regarding claim 41: The prior art of Wang et al teaches relative movement between the processing head and the substrate at all times of processing including during the application of pulse voltage, see Figs. 20A, B.

Regarding claim 54: Wang et al fails to specifically state that the anodes are made of conductive diamond. However, on page 14 lines 1-6 of Wang widely available electrically conductive materials are used to construct the electrodes. Barring a showing criticality of this particular material of construction. The examiner opines that the material of construction of the anodes is within the design choice of one ordinary skill in the art and that it would have been obvious for one of ordinary skill in the art to choose conductive diamond as it is a durable material that is able to withstand the stresses of the treatment apparatus.

Regarding claims 55 and 56: See Wang et al, for example Figures 20A, 22A, and 36A.

4. Claim 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of Boyd et al, as applied in claims 34, 38, 40, 41, and 54-56 above, and in further view of Talieh (WO 00/26443).

The teachings of Wang et al as modified with the ultrasonic transducer of Boyd et al were discussed above. The combination fails to teach specifically that the distance between the cathodes and anodes relative to the substrate is different.

Talieh teaches a substrate processing apparatus 10 comprising: a substrate holder (wafer head assembly 16) (note the type of film on the substrate does not structurally limit the apparatus as the substrate (wafer) worked upon is not part of the apparatus, see *In re Young*, 75 F. 2d 966, 25 USPQ 69 (CCPA 1935), a processing head (pad assembly 12 having anodes 30 and cathodes

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28, a processing liquid supply section, and a power source, see page 5 lines 13-25. The processing solution is an electrolyte, see the abstract of Talieh.

Talieh further teaches that the distance between the substrate and the anodes and the distance between the cathodes is different see Fig. 1B and 2. The motivation of designing the electrodes of Wang et al as taught by Talieh et al is that Talieh provides an alternative design of the processing head as either the anodes and cathodes would be designed as equidistant from the substrate or not. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the processing head of Wang et al as modified by Boyd et al to have the distance between the anodes and the distance between the cathodes to be different.

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438.

The examiner can normally be reached on M-Th during the hours of 8 a.m. and 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

November 20, 2008

/Sylvia R MacArthur/  
Primary Examiner, Art Unit 1792